

The Ecology of Cooperative Learning in Elementary Physical Education Classes

Ben P. Dyson,¹ Nicole Rhodes Linehan,² Peter A. Hastie³

¹University of Auckland, ²Jonas Clarke Middle School, Lexington,

³Auburn University

The purpose of this study was to describe and interpret the instructional ecology of Cooperative Learning in elementary physical education classes. Data collection included a modified version of the task structure system (Siedentop, 1994), interviews, field notes, and a teacher's journal. T-tests of the quantitative data revealed that instruction time, management time, transitions, and wait time decreased significantly during the units and refining, extending, and applying tasks increased significantly. Cognitive/social tasks were observed consistently in every lesson and contributed to student learning. Inductive analysis and constant comparison were used to analyze the qualitative data (Patton, 1990). The researchers identified four main categories from this data: organization and management of students, roles, skill development, and strategizing. To promote individual accountability the teacher used task sheets, assigned Cooperative Learning roles, kept group sizes small, randomly chose students to demonstrate their competence, and asked students to teach their teammates skills and tactics.

Keywords: cooperative learning, ecology, physical education

Cooperative learning (CL) is an instructional model in which students work together in small, structured, heterogeneous groups to complete group tasks (Dyson, 2002), and in which group members help each other learn while achieving group goals. While there are various approaches to CL, five essential elements are recommended by Johnson & Johnson (1989) to fully implement CL. These are positive interdependence, individual accountability, promotive face-to-face interaction, interpersonal and small group skills, and group processing.

Positive interdependence exists when students perceive that they are linked to group members in such a way that they cannot succeed unless other group members do. That is, students rely on each other to complete the predesigned task. Individual accountability refers to students taking responsibility for completing their part of the task for their group. Accountability mechanisms like student task sheets hold students individually accountable and create a situation where assigned tasks

Dyson is with the University of Auckland—Health and Physical Education, Auckland, New Zealand. Linehan is with Jonas Clarke Middle School, Lexington, MA. Hastie is with Auburn University—Kinesiology, Auburn, AL.

are more explicit for students. These accountability strategies attempt to ensure there are no “free riders” (Slavin, 1996) or “competent bystanders” (Tousignant & Siedentop, 1983). Face-to-face promotive interaction is literally head-to-head discussion within the group while group members are in close proximity to each other. Interpersonal and small group skills are student behaviors that allow free and easy communication between group-mates. They are developed through the tasks in which students participate and may include listening, shared decision making, taking responsibility, giving and receiving feedback, and encouraging each other. Group processing is usually in the form of an open dialogue or group discussion related to the lesson content that can occur at any time during the lesson (Dyson, 2002).

Research in general education has demonstrated that CL can improve academic achievement, active learning, social skill development, and classroom equity (e.g., Cohen, 1994; Gillies, 2006; Johnson & Johnson, 1989; Slavin, 1996). Gillies (2006) suggested that CL can provide instruction that leads the student to more authentic learning experiences, allows for more active participation, is more meaningful, and empowers students to learn complex content. CL has a dual learning emphasis on social and academic goals (Antil, Jenkins, Wayne, & Vadasy, 1998; Cohen, 1994). In addition to this dual focus, when CL is used in physical education, the psychomotor domain of learning is added as a priority (NASPE, 2004).

Several studies have suggested that fidelity to research-based CL is often problematic and requires more than students merely working in groups (Antil et al., 1998; Gillies, 2006). In his instructional models work, Metzler (2005a) presented specific benchmarks to verify that CL was planned and taught with close adherence to the model’s design. These benchmarks are presented in the methods section of this paper. Metzler (2005a) stated that in the CL instructional model the three learning domains (psychomotor, cognitive, and affective) “take on a reciprocal relationship – learning in one domain is dependent on learning in the other two” (p. 267).

A number of writers in physical education have encouraged the use of CL as an instructional model for change because of its focus on cognitive and social goals in addition to motor skills (Barrett, 2005; Dyson, Griffin, & Hastie, 2004; Metzler, 2005a; Metzler & McCullick, 2008; Rovegno & Kirk, 1995). Another instructional model that has similar goals in PE and is more well-known is Sport Education (*SE*). *SE* focuses on “sport culture” and “sport literacy” which require players to learn the rules, history, and traditions of the sport. This feature is not necessarily an element of CL. CL and *SE* both involve students in clearly defined roles, often creating positive interdependence. However, in CL the essential learning tasks are designed for students to be held individually accountable, whereas in *SE* these tasks contribute more to group goals and group or team accountability. *SE* has one structure or organizational format whereas CL has a large number of structures to choose from, such as: learning teams, jig-saw, or think-pair-share (Johnson & Johnson, 1989). In addition, CL can be used with younger students where *SE* is generally used with older students at the middle and high school levels. For a more detailed discussion see Dyson, Griffin and Hastie (2004) or Hastie and Siedentop (2006).

Despite the apparent support for academic and social goals in physical education, there is only “a beginning literature on CL in PE” (Barrett, 2005, p. 89). Recently however, several researchers have studied CL in elementary physical education. In a Canadian elementary school CL program, Dyson (2001) reported that the teacher believed that cooperative learning had enabled students of all skill

levels to improve motor skills, develop social skills, work together as a team, help others improve their skills, and take on greater responsibility in the gymnasium. In another elementary program in New England, Dyson (2002) argued that the teacher and students had a common understanding of CL that emphasized student goals and roles, student accountability, communication skills, students working together, and the importance of quality practice time.

Barrett (2005) studied sixth grade physical education classes' use of a strategy called Performer and Coach Earn Rewards (PACER), which employed Slavin's (1996) three elements of CL: cooperative interaction, individual accountability, and group contingency (referred to as positive interdependence by Johnson & Johnson, 1989). Barrett found that PACER was successful at increasing students' percentage of correct trials during practice with task cards compared with whole-group instruction. PACER motivated students to be involved in more motor appropriate practice.

Polvi and Telama (2000) investigated fifth grade female students' development of social helping behaviors in physical education using a form of CL similar to the reciprocal style of teaching (Mosston, 1981). The authors found that students in the experimental group who were systematically assigned new partners every three weeks helped their partner (e.g., giving instructions, demonstrating, correcting errors, and encouraging) more than students who either chose their own partner or worked individually. Polvi and Telama suggested that students learn social helping behavior by practicing in situations specifically organized for that purpose.

Lafont, Proeres, and Vallet (2007) studied game discussions during a CL basketball unit in elementary physical education. In the experimental group, team members debated with their group-mates, analyzed their actions, and worked to reach a common goal of improving their performance. The control group performed individual motor tasks (passing, dribbling) while the experimental group had team discussion (group processing). Interpersonal relationships were assessed by a sociogram and game efficiency was calculated by shooting ratio and skill levels with and without the ball. The researchers found that oral discussions among peers about the goal and strategies of the game allowed motor and tactical skills to develop.

The Classroom Ecology Paradigm

This study examined the nature of CL in physical education through the lens of the classroom ecology paradigm, which was developed by Doyle (1977, 1986). Also known as the ecological model, this is a study of classroom life as it naturally unfolds. Doyle's work emerged from his concern that classroom research had a narrow emphasis on the teacher and a lack of focus on student behaviors and their social interactions. Hastie and Siedentop (2006) explain that, "studies utilizing the classroom ecology paradigm focus upon the tasks that operate in classrooms" (p. 215). Doyle (1977) represented two main task systems in the classroom, the managerial (maintaining order) and instructional (promoting learning). The managerial system provides rules, routines, and expectations for students to follow to allow learning to take place. The instructional system involves the presentation and practice of subject matter. A third task system emerged later in an attempt to explain student social interactions. This social task system was first emphasized by Allen (1986), who described the social system as having two major goals, that of socializing and that of passing the course. Due to the interactive nature of physical

education, teachers and students seek social interaction during physical education classes. Research from Sport Education and Adventure Education in physical education has extended Allen's (1986) work to argue that the social task system can actually enhance, not necessarily impede student learning (Carlson & Hastie, 1997; Hastie, 1995, 2000). We would suggest that CL is another instructional model in which social interaction can contribute to learning gains in the psychomotor and cognitive domain of learning.

Few studies have examined the ecology of the gymnasium in elementary physical education settings. In one important work, Jones (1992) analyzed the task systems in 34 elementary physical education classes, and found that teachers emphasized their managerial systems at the beginning of the school year to gain and maintain student compliance. Once routines were established, the fifth grade students spent most of their time on extending and applying tasks (Rink, 2003). (These terms are defined in the methods section of this paper). Jones found that teachers did not ask students to perform refining tasks to improve skill performance. In fact, only three refining tasks were identified in all 34 lessons.

More common in the physical education literature are studies using the ecological model in middle and secondary schools. In his analysis of the ecology of Sport Education, Hastie (2000) found high levels of enthusiastic student engagement in all three instructional systems. In the social task system "fun" and "getting along" emerged as key factors. In this study fun meant playing and helping others, and refereeing or scoring during game play. Students found it fun to take on some of the responsibilities of the teacher. Congruent with other research (Carlson & Hastie, 1997; Dyson, 2001; Metzler & McCullick, 2008), students liked being taught by their classmates; that is, "kids prefer having a student coach" (Hastie, 2000, p. 368). "Getting along" was demonstrated by students playing in a team and positively interacting with other students that they normally would not talk to during a class (Hastie, 2000). In an ecological analysis of CL in a high school physical education program, Dyson and Strachan (2004) found low management time and high engagement time. Instruction time decreased throughout the unit for both eighth and eleventh grade classes. Applying tasks comprised approximately half of engaged time, while refinement tasks made up approximately 16%. Students' social interactions contributed to the instructional task system. Cognitive/social tasks, which appeared in every lesson, typically involved strategizing or group discussion about a particular aspect of a skill or tactic. Accountability included: individual testing, member signatures, peer feedback to each other, and teacher monitoring and interaction.

Tousignant and Siedentop (1983) found that the nature of the task influenced the students' responses and that accountability drove the managerial and instructional task systems. Individual accountability is the cornerstone for all effective instruction but plays a unique part in CL because without it students could "get a free ride" (Slavin, 1996) or rely on the other group members to complete their work. In a typical physical education class accountability often takes the form of "informal accountability" where the performance does not directly contribute to the student's grade (Lund, 1992). This was demonstrated by Jones (1992), who reported no instances of formal accountability in her study of elementary physical education. Essentially, "the work that eventually gets done in classes" is based on the teacher's accountability mechanisms and a strong "program of action" (Hastie & Siedentop, 2006, p. 222).

We are not aware of any studies analyzing the ecology of CL in elementary physical education. Given the potential of the classroom ecology paradigm to provide a thorough understanding of instruction, management, and social tasks in the gymnasium and given the limited account of this model in elementary settings, the purpose of this study was to describe and interpret the instructional ecology of CL in elementary physical education classes.

Method

Participants and Settings

The participants in this study were a teacher and her 47 students (25 girls and 22 boys) in two mixed third and fourth grade classes at Tui Elementary School (pseudonym) in New England. Pseudonyms were used for teacher and students. Institutional Review Board (IRB) and school district approval were obtained before the study. The class population was 91% Caucasian, 4% Asian, 3% African-American, and 2% Hispanic. The students had one 30-minute lesson on Monday and one 45-minute lesson on Thursday each week, and at the time of the study had no previous experience in CL in physical education. The teacher, Anna Mayes had taught physical education at Tui Elementary for eight years.

Lesson Content and Procedures

Twenty-four CL lessons in two units related to (i) throwing and catching and (ii) kicking were observed in this study over a 15-week period. Lesson content included: dribbling, kicking with different kinds of balls, throwing and catching with different kinds of balls and objects (bean bags), offensive and defensive tactics, modified kicking games, and modified throwing and catching games. The research team, comprised of the teacher, a university faculty member, and a university graduate student, developed lesson plans based on this content and the CL structures of Pairs-Check-Perform and Learning Teams (Dyson, 2002; Dyson & Grineski, 2001). Pairs-Check-Perform was similar to Mosston's (1981) reciprocal style of teaching in which students are assigned to work in pairs, with each student given responsibility as either an observer or performer, with the additional accountability of students checking another pair's performance. In Learning Teams, students work in small groups of four using the assigned roles of recorder, encourager, equipment manager, and coach (Dyson & Grineski, 2001) to develop their skills and strategies in modified games.

Based on her previous knowledge teaching these students, Anna assigned students to groups to ensure that teams were heterogeneous by ability and gender. Students began the unit in pairs using Pairs-Check-Perform and progressed to working in groups of four in Learning Teams. When introducing new content or when Anna determined students needed it, she would provide a brief demonstration of the task, emphasizing the learning cues. Tasks were designed to create positive interdependence. For example, in a kicking game each student had to pass the ball before the team could score a goal. Anna planned for group processing by asking students to discuss game strategies in their groups or as a whole class during and after the lessons. An example of group processing was students creating a group defensive tactic to improve their game play and was coded as cognitive/social tasks.

Accountability was embedded in the tasks and group work; that is, the tasks were designed to hold each student accountable for completing his/her part of the task within their group (Hastie & Siedentop, 2006). Individual accountability was demonstrated by each student taking a role that lasted for the duration of the unit. Anna frequently monitored and interacted with students during each of the lessons. This is an example of “active supervision,” which is defined by Hastie and Siedentop (2006) as teachers continually reinforcing task demands and a high standard of performance. The teacher also held students accountable for skills acquisition through task sheets that explained the learning cues or skills and were then checked off or signed by other group members and/or the teacher when completed (see Figure 1 as an example of a task sheet). To further promote individual accountability Anna kept group sizes small and randomly chose students to demonstrate their competence.

Data Collection

This study relied on multiple methods of data collection. Data sources included interviews with the physical education teacher and all students, an analysis of the ecology of the gymnasium using a modified version of the task structure system (Siedentop, Doutis, Tsangaridou, Ward, & Rauschenbach, 1994), a teacher reflective journal, and nonparticipant observation of all lessons. Data were also collected through field notes, informal interviews, and document analysis. The teacher’s lesson plans and unit plans, the school district guidelines, and other written documents related to the program were collected, read, and reread to provide a richer understanding of the program.

Teacher Interviews. Brief unstructured interviews occurred at the beginning of each lesson to determine Anna’s specific goals for that lesson. Structured interviews occurred after each observed lesson for approximately 15–20 minutes to obtain her perspectives of the lessons. Interview questions included: “Did you achieve your goals today?” and “What elements of CL did you use today?” At the beginning and end of the teaching units the researchers conducted in-depth structured interviews ranging from 85 to 95 minutes. The open-ended and in-depth interviews were audiotaped and transcribed for analysis. The interviews focused on Anna’s and the students’ understanding of CL as an instructional model and the teacher’s experiences related to the implementation of CL.

Student Interviews. To gain an understanding of students’ perspectives regarding the CL program, groups of three or four students were interviewed after each observed lesson for approximately 10 minutes. All students in both classes were interviewed at least once. Fifteen randomly selected students were interviewed twice to check consistency of student responses. These students gave similar responses on two different occasions. All interviews were audiotaped and transcribed for analysis. Protocols for interview questions were developed with reference to the literature on student voice (Dyson, 2006; Graham, 1995) and after the research team spent an extended period of time (two years) conducting previous research in the school. Examples of interview questions were: What was your role today? What was the best part of the lesson? What didn’t go well today for you? While questions were deliberately general in nature to allow students to comment on what was most important to them, reviewing the transcripts demonstrated that

Dribbling with a ball Task Sheet

Objectives:

Motor: Students will be able to dribble the ball using three of the four learning cues.

Cognitive: Students will be able to recall three of the four learning cues.

Affective: Students will be able to work with their group to achieve the task.

When you all feel that you are ready, complete the form below:

Awesome - uses the cues every time

Good - uses the cues most of the time

Needs Work - rarely uses the cues

Learning Cues:

Names	Crouched position – bent knees	Keeps the ball close to the body	Keeps eyes forward	Taps ball with inside, outside, & laces

Tasks:

**** Remember after each task ask [Ms. Anna] to check your form to make sure your group is ready to move on to the next task.**

- _____ a. set up some domes or cones to dribble around
- _____ b. dribble the ball from one cone to another
- _____ c. dribble the ball around the outside of your square
- _____ d. dribble the ball around the inside of your square
- _____ e. dribble the ball around the inside of your square and stop the ball when the coach says stop
- _____ f. create your own task (Please describe/ draw)

Group Processing:

- 1) Name something that your group did very well during this lesson.
- 2) Name one thing that your group needs to work on.

Figure 1 – Task sheet for dribbling with a ball.

most students' comments related to CL. Questions were followed by probing comments to elaborate on students' responses.

Classroom Observations. The study also involved nonparticipant observation of the two classes using an organized method of taking and organizing field notes (Schatzman & Strauss, 1973). The investigators took field notes during the physical education classes and during or after observations in the classrooms, the playground, or staff room at Tui School.

Systematic Observations. The research team observed and videotaped all lessons. In addition, the teacher's voice was recorded by a wireless microphone. Videotaped lessons were systematically analyzed using a modified version of the task structure system (Siedentop, 1994). A description of the task structure system appears in the data analysis section. The purpose of this analysis was to determine how the teacher organized and presented the curriculum and how the students responded to that instruction.

Reflective Journal. Anna wrote a Post-Teaching Reflective Analysis (Dyson, 1994) after each lesson and a reflective journal at the end of each school day. The teacher answered five questions including: What were your goals? How do you know you met your goals? What was the most positive aspect of today's lesson? What would you change next time you teach? What did the students learn today?

Reliability. Two researchers trained on the task structure system performed interobserver reliability. The observation records of one observer were compared with those of a second observer (van der Mars, 1989). Ten percent of the tapes were randomly selected for a test of interrater reliability. The criteria established for an acceptable level of interobserver agreement scores was set at 80%. Results for reliability checks with the data were calculated using a formula of $\text{agreements} / (\text{agreements} + \text{disagreements}) \times 100$. Reliability scores ranged from 82 to 100% demonstrating that agreement was over 80% in each category.

Data Analysis

With regard to the quantitative data from the modified task structure observation instrument, means and standard deviations were first calculated, and then *t* tests were used to determine if there were any significant differences between the beginning third of the units and the end third of the units.

The research team used the task structure observation instrument to collect data to represent the managerial tasks, instructional tasks, and students' responses to those tasks. Managerial tasks were coded as management, transition, waiting, and off-task. Instructional tasks were coded as extending, refining, and applying tasks as defined by Rink (2003) with the addition of cognitive/social tasks to provide more information regarding the students' social task system. Cognitive/social tasks were defined by Dyson (1994) as tasks that required students to ask or answer questions, problem solve, make a decision, strategize, or discuss information related to lesson content during the lesson or in a debrief at the end of the lesson. There was no physical activity during the cognitive/social tasks. Extending tasks indicated a change in the conditions of practice to alter the focus of skill or tactical development. Refining tasks focused on the quality of the performance, or what it takes to

be successful at the skill or tactic. Applying tasks were routines, modified games, or assessments that occurred in the lesson (Siedentop, 1994).

Students' responses were coded as part of the task structure system as Opportunities to Respond (OTRs). OTRs were also coded as successful or unsuccessful. OTRs were defined as student activity that was related to the unit content (Hastie, 2000), for example, in the kicking unit, kicking a ball.

Inductive analysis and constant comparison were used to analyze the qualitative data throughout the research process (Lincoln & Guba, 1985; Patton, 1990). The constant comparison method was used "to group answers...to common questions [and] analyze different perspectives on central issues" (Patton, 1990, p. 376). Representative quotes were drawn from the teacher interviews, student focus groups, field notes, and written documents after repeated reading and rereading of the data. This formed the first-order analysis, which showed thematic descriptions of the implementation of CL. In the first instance, descriptive codes were used to identify potentially interesting behaviors and events. This was followed by more inferential coding in which conceptual linkages were made that were used in the development of new categories. This second order analysis explored the patterns that emerged from our interpretation of the implementation of CL in the physical education program.

Lincoln and Guba (1985) recommended that researchers establish trustworthiness of the data by demonstrating that the work has credibility, transferability, dependability, and confirmability. Credibility was achieved through extended engagement with the school, since this was the third year working at Tui Elementary. In addition, two member checks were carried out. The first member check consisted of returning all interview transcripts to Anna providing her an opportunity to modify or clarify any aspect of the interviews. Only editorial and semantic changes were made. The second member check involved Anna reading a draft of the manuscript to verify interpretations. No substantive changes were suggested. Member checks were not carried out with the students due to their age.

Throughout the process, peer debriefing with colleagues was an important part of the data analysis. The nonparticipant observations, document analysis, interviews, and field notes triangulated the findings. Dependability of the findings was enhanced by laying out an audit trail for a colleague that is familiar with this research, but not directly involved with it (third author). This colleague was then able to challenge the logic behind our interpretations and the conclusions subsequently drawn, resulting in a much more reflective process and account than would otherwise have been possible. We have attempted to satisfy Lincoln and Guba's (1985) criterion of confirmability by providing a reflexive, self-critical account by triangulating our findings and interpretations.

Instruction and Treatment Validation

For the results of this study to be valid, it was necessary to demonstrate that CL instruction and implementation was consistent with the accepted standards for that model. Metzler (2005b) lists key procedures through which determination of acceptable fidelity might be achieved. These are (i) the researcher must fully explain the model under study, noting all of its relevant features, (ii) the researcher must then document that those features were in fact present in the instructional unit, by

itemizing the key teacher and/or learner processes designed into the model, and then verifying that those processes were sufficiently present in the units, and (iii) demonstrating that the necessary contextual and operational requirements for the model were met. This section will discuss procedures two and three, given that a more complete outline of CL is presented earlier in the manuscript.

Metzler (2005a) created a checklist to verify that CL is observed during physical education classes. "These benchmarks verify that the unit has been planned and implemented as closely as possible to the model's design" (p. 278). Two CL trained observers independently determined that the CL benchmarks were present during randomly selected classes (Lessons 5, 9, 15, and 21). Both observers were licensed physical educators, had attended CL workshops, and studied CL as an instructional model. The observers were trained and then reached interrater reliability of over 80% for each of the tapes coded (van der Mars, 1989).

Cooperative Learning teacher benchmarks were: (i) heterogeneous groups (i.e., equitable), (ii) teacher selects an appropriate assigned learning task, (iii) teacher selects an appropriate cooperative learning structure (strategy), (iv) teacher frames the assigned learning tasks (developmentally appropriate), (v) teacher serves as a facilitator during the task, (vi) teacher monitors and processes for social learning outcomes, (vii) teacher designs assessments of performance for social learning.

Cooperative Learning student benchmarks were: (i) students view teams as being fair, (ii) students understand the assigned task, (iii) students understand cooperative structure (strategy) in place, (iv) teams share the work and the accountability across all members, (v) teams used peer teaching to improve performance and publicly support each member's efforts, (vi) teams show improvement on performance assessments (Not observed), (vii) teams show evidence of social learning (Metzler, 2005a).

All benchmarks were observed except one student benchmark, "teams show improvement on performance assessments." Observers were not able to compare assessment scores over time as stated in Metzler's (2005a) criterion; however, this expert teacher (Anna) reported that students improved their skills and strategies during the units. After each lesson she collected task sheets containing a learning cue rubric based on the skills or strategies for the lesson. For example, kicking: step into the ball, place foot beside the ball, and follow through.

Demonstrating the Necessary Contextual and Operational Requirements. As Metzler (2005b) has noted, by design, an instructional model needs to have in place essential contextual conditions such as teacher expertise and student readiness for a model to have any chance of working. Anna had been teaching for ten years and was considered one of the most effective physical educators in the local area according to her principal, university faculty, and student teachers. She had received the state elementary physical education teacher of the year award. With support from the school district Anna had attended one full day and one five-day workshop on CL. She had also presented CL workshops at state, regional, and national conferences. Her students were used to working in teams and were provided with appropriate equipment (a ball between two) and resources (clip-boards, task sheets, pencils) to be successful at completing their CL tasks.

Itemizing Teacher and Learner Processes. To confirm the behavioral fidelity of the teacher's instruction according to CL principles, one should see patterns

across the instructional time of the unit. Specifically, these would be (a) reductions in instruction, management, transitions and waiting as the unit progressed, (b) consistent use of cognitive/social tasks throughout the unit, and (c) increasing examples of instructional tasks as the unit progresses. The duration and percent of lesson time of selected teacher behaviors were collapsed into “unit thirds” to represent the early, middle, and later stages of the unit. Each third consisted of four lessons. Table 1 shows the summary data for student behavior from the initial implementation of CL to later in the units for both classes. From this table it is clear that the teacher followed an instructional pattern that would be expected during CL.

Table 1 Mean Percentage of Lesson Time for Task Structure Behaviors for Both Units for Both Classes

Category	Mean percent lesson time (initial) **	Mean percent lesson time (late) ***	t (4) =	p =
Instruction	27.95	17.42	5.08	.041 *
Management	1.99	0.00	5.81	.030 *
Transitions	15.48	8.05	27.15	.001 *
Waiting	9.51	4.42	7.44	.016 *
Cognitive/social tasks	24.42	22.33	0.14	.715
Refining tasks	1.26	13.14	41.35	.001 *
Extending tasks	7.45	19.58	7.87	.014 *
Applying tasks	2.60	14.31	4.83	.045 *

* Significant at the 0.05 level

** Initial – first third of unit

*** Late – last third of unit

Results

Quantitative Data

T-tests were performed on the quantitative data from the task structure system to determine if there were any significant differences between the beginning third of the units and the end third of the units. This data analysis suggested a pattern that would be congruent with teaching CL.

Data from the modified task structure observation instrument presented in Table 1 illustrate that Anna allocated her time differently at the beginning and end of the units. At the beginning of the unit she spent more time on management and instruction, with a subsequent significant decrease in instruction, management time, transitions, and waiting from the beginning to the end of the CL units. Once CL was established, the amount of time Anna spent on management, transition, and wait time decreased significantly and this allowed her time to concentrate on facilitating students' skill and tactical performance.

Since Anna did not need to devote as much of her time to management and organization of the classes as the units progressed, she was able to provide more specific skills feedback during cognitive/social, extending, refining, and applying

tasks. Significantly more refining tasks were used in the last third of the units. Refining tasks were higher with 14 refinement tasks in 24 lessons compared with Jones (1992) who found only three refining tasks in 34 lessons. In CL structures the students were encouraged to provide specific skill feedback to their teammates; therefore, refining tasks were given by both the teacher and group mates. The refinement tasks were developed for the lesson plans with input from the research team. The refinement tasks were not stated on the task sheets, however, the basis of most refinement tasks were the specific learning cues, which were listed on the white board and stated on the task sheet. There was also a significant increase in extending tasks. Off-task behaviors occurred in only 6 out of the 24 lessons, ranging from 0.5 to 1.8% of the lesson time. This suggested that students were compliant with the managerial system. Once the routines were established in this gymnasium the teacher assumed the role of facilitator which meant she was walking around the gymnasium checking that all students were on task, reminding groups what to do, and providing skill and tactical feedback.

Opportunities to Respond (OTRs) were observed as student activity related to the unit content (Hastie, 2000), for example, kicking a ball. OTR data suggested that students were very successful with their tasks. The OTR percentage success, which is calculated by appropriate OTRs over total OTRs, ranged from 78% to 89% of the lessons during refining, extending, and applying tasks.

The use of cognitive/social tasks did not change over the course of the units, but remained consistent and occurred in every lesson. There were only two class periods that had less than 10% of the lesson time allocated to cognitive/social tasks. Both lessons were modified soccer games in the kicking unit. In her third year of implementing CL, Anna had a specific focus on cognitive/social tasks to achieve her goals. This was demonstrated by complex tasks, recommended by Cohen (1994), which were written on the task sheets and the white board.

Qualitative Data

The following qualitative data represent the teacher's and students' perspectives on the implementation of CL in physical education classes. The researchers identified four categories from the data. These have been labeled as (i) organization and management of students, (ii) CL roles, (iii) skill development, and (iv) strategizing.

Organization and Management of Students. The organization of students in their cooperative groups required more time at the beginning of the units, and decreased during the units. Data from teacher interviews and field notes reflected this use of time. In the first lesson of the kicking unit Anna spent a large portion of the lesson explaining the kicking task sheet and reviewing the roles (Field note). In lesson two Anna complained, "There was too much time organizing the students and time spent setting up the equipment." Later in the unit, the teacher and students became more comfortable with the content. Anna commented that "There were a lot of transitions and they handled each transition really well." About half way through the unit in lesson six, Anna explained routines that allowed organization time to decrease: "The groups stayed the same and there were colored cones at the front of the class marking each team – this allowed for teams to get organized quickly." A field note from lesson eight explained what the classroom looked like once students had mastered the routines of CL:

The students arrived at the gym door. They walk in with a cheery hello from Anna. They get their folders without being instructed to do so and moved to their spot on the floor. They open their folder and place their task sheet for the day on their clipboards. The group discusses their roles. The team captain demonstrates the correct form of the kicking skill. The students start practicing kicking in their pairs. The teacher monitors and interacts with the students. First she quickly moves around to ensure that all students know what to do and are on task. Then she moves to the group that she knows will have trouble.

By lesson 10 instructions had become efficient, as Anna described, “I briefly explained all the sheets and had the task written on the white board.” At the end of the unit, Anna wanted the students to work independently from her. After lesson 12 she explained, “With prompting the students understand when to change to the next activity. Some groups were able to do this without prompts.” While managerial time did decrease steadily throughout the units, this process was not automatic. Anna continually critically reflected on her teaching, the students, and the implementation of CL.

Cooperative Learning Roles. In this CL unit, the roles of coach, encourager, equipment manager, and recorder were designed to allow students to take responsibility for specific tasks in their classes, and to encourage social interdependence that allowed students to work together to complete a task. In lesson seven Anna described how the lesson functioned when students were performing their roles:

I knew the class went well because the students were following their roles. The coach was explaining the stations to the group. The team manager was keeping track of the clipboards. The stations were ready for the next group, which was the responsibility of the equipment manager. Finally the encourager was giving their group GREAT feedback. They all had great comments on that section of their task sheet.

The teacher’s comments were echoed by field notes: “Anna reinforced the roles and responsibilities: She would say ‘If the group isn’t working, I’m going to ask the coaches what’s going on.’ The students were working hard to do their job – especially the encouragers” (Field Note). Anna held the students accountable and set clear expectations for the students: “Coaches need to know that they were only allowed to sign the task sheet if all the cues were used by the kicker.”

Student interview data illustrated that students seemed to understand their roles and take them seriously. Tiffany reported: “My job was the encourager and to say good things about them like: ‘Good job’, ‘You almost got it.’ Things like that. And I did a good job.” Albert reported, “I was the team manager and I was supposed to organize the group and solve problems when we had them.” Of all of the roles, the responsibilities of the coach were the easiest for these students to articulate. After lesson 11, Mary explained:

I was the coach because I was telling most of my group—They didn’t follow through or step a lot of the times and they didn’t follow through at all and I kept telling them that they needed to follow through...so I kept acting like the coach and telling them and kept explaining to them.

Jose stated that the job of coach was to “make a comment on their skill and say good, good, you are doing better on the cues.”

Skill Development. Earlier lessons focused more on skill learning with students practicing motor skills in pairs. As the unit progressed this focus changed to a more tactical orientation, as more applying tasks became part of the lessons. During the early stages of the units, students were able to articulate the important skill cues of throwing:

Mary: You step with the opposite foot and then you point where you are going to throw the ball and then you let go of it...you bring it over your shoulder and then you let go of it and follow through.

Suzie: You have to remember to step and bring the ball back and throw.

Katrina explained her skill improvement during the kicking unit. “I’m a better kicker now. Well I used to kick with my toe by accident but I am really good at kicking so I just use the inside of my foot now.”

A typical goal for Anna was for students “to work on the kicking and that the coaches were able to observe their kicker and give their kicker feedback and that the kicker was able to kick using good form.” Anna believed she had met her goals for a lesson because

I saw the kids were there with the task sheet, they were watching. And the kids were kicking towards the goal—their goal...And they were using the inside part of their foot and they were using the instep so they understood the difference between the two kicks.

After lesson 11, Anna stated, “Yeah, I think that they really understood the components of the throw. I saw a lot of people pointing at their target.” By lesson 12 Anna commented: “I’m starting to hear more [specific cue] feedback and encouragement.” Anna was pleased that students were able to transfer skills from one unit to another: “There was transfer from the kicking unit where they had to say their name or make eye contact before passing. So, I was really excited about that. That it transferred over.”

Strategizing. In addition to developing greater skill, these grade three and four students learned more about game tactics and were able to develop their own game strategies. Student discussions or strategizing about the best tactics for the game were coded as cognitive/social tasks. Anna asked students to create their own rules and elements of the game, which made the instruction more complex for students. “Anna wanted to see students use strategies in the games they played. Not just use skills in isolation” (Field note).

Students were able to articulate the strategies they developed. Heather said her group’s strategy was: “Keeping control of the ball and keeping it near you and protecting the ball.” Chris admitted that tactics were not always successful: “We had a strategy that when we kicked, we said their names. Well, [during the game] we didn’t really call the names.”

Anna observed students’ increased ability to strategize. After lesson seven, she asked students about their tactics: “I debriefed that and found out the different

strategies that kids used.” During group processing students were able to reflect on their tactics during game play. Anna said, “The class gave me really good feedback: What they thought they did well. What they need to improve on. The offensive players were really passing the ball...and the defensive players were not holding back with the goalie.” By the end of the unit, the teacher was happy with student progress: “The students began to develop strategies, especially during their strategizing session with their team. One team even teamed up with another team which was the task for the next lesson.”

Students’ increased skills and greater understandings of the tactics of kicking games were reflected in their game play. By the eighth lesson students were clear about their positions in the game: “Yeah, [Bill’s] going to be the goalie, [Sam’s] going to play the offense and [Becca] is defense” (Tom). Anna noticed improved game play after lesson nine: “Offense were really starting to move the ball and defense were able to move forward and not just hang back.”

Discussion

Multiple data sources in this study paint a picture of life in the gymnasium using CL as an instructional model. The managerial and instructional task structure data were consistent with the teacher quotes, reflections, and field notes. The higher management, transition, and wait times at the beginning of the implementation of the CL units were consistent with the research of Jones (1992). Instruction time was also high at the beginning of the units as the teacher explained student roles and tasks. Anna presented clear, consistent instructions on the expected behaviors and structured the classroom so the roles and tasks became routine. The organizational structure, such as students staying in the same teams, allowed managerial time to decrease during the units, similar to the findings of a study of the ecology of CL in high school physical education (Dyson & Strachan, 2004). Instruction time and managerial time decreased throughout the unit as students became familiar with the roles and content, and began to take responsibility for teaching each other the skills. This progression would be expected during any effective teaching, however, this trend is more pronounced during CL as students take on greater responsibility for managing and organizing themselves in their groups. Student quotes suggest that they enjoyed taking on roles and took their jobs seriously. They understood the roles, assigned tasks, and cooperative structure and could articulate the job each was expected to complete (Metzler, 2005a). This research supported other findings that students can “recognize the major engagement patterns and learning outcomes embedded in the model” (Metzler & McCullick, 2008, p. 514).

As the unit progressed, a decrease in managerial time allowed for increasing numbers of refining, extending, and applying tasks to be incorporated into lessons as students worked on improving skills and tactics. The larger number of refining tasks in this CL program is in contrast to the findings of Jones (1992) who observed few refining tasks in her analysis of elementary PE, but was congruent with Hastie’s (2000) analysis of Sport Education. Rink (2003) has argued that a large number of refining tasks and extending tasks fosters improved skills and tactics in game play. Students could articulate the learning cues and appeared to be able to analyze each other’s skill and give appropriate skill feedback to their teammates. Students were

positively interdependent on each other and helped their group-mates learn new skills by demonstrating, correcting errors, encouraging, and referring to the specific learning cues. These social helping behaviors are similar to those in a physical education CL program reported by Polvi and Telama (2000). The nature of CL allowed social interaction to assist with the completion of curricular goals rather than impeding student learning, similar to Hastie's research on Sport Education and Adventure Education (Carlson & Hastie, 1997; Hastie, 1995, 2000).

Throughout the lessons the teacher consistently used cognitive/social tasks, an appropriate engagement pattern for CL. This quantitative finding from the task structure system was reflected in the qualitative category of "strategizing" that emerged from the students' and teacher's interviews. Cognitive/social tasks were activities such as group processing, creating their own tactics and strategies, and inventing their own games and rules. The prevalence of cognitive/social tasks demonstrated that students strategized or discussed tactics especially during the game play. In addition, Anna encouraged students to solve their own problems in their group rather than going to her for an immediate solution. This strategy of "sorting out your own problems" encouraged positive social skills and social interdependence. The teacher in this study frequently used group processing to help students reflect and strategize in their teams and believed that group discussions about the goals and strategies of the game allowed motor and tactical skills to develop, similar to research findings by Lafont, et al., (2007). When students modify game play it is more meaningful and empowering than direct instruction (Kirk, 2005). Social and cognitive tasks have also been reported in Sport Education (Hastie, 2000) and Teaching Games for Understanding (Kirk, 2005).

Toussignant and Siedentop (1983) stated that accountability drives the task system and, in this program, accountability was embedded in the tasks. CL uses peer accountability in that students rely on each other to complete the tasks. Students were motivated by the curriculum and engaged with the content. To hold students individually accountable, which is a key element of CL, Anna reviewed students' task sheets and randomly asked students to demonstrate the skill that they were performing. She actively monitored and interacted with students' groups, as described by Lund (1992) as informal accountability. Roles also helped the students share the accountability with their teammates (Metzler, 2005a). Hastie and Siedentop (2006) argued that when tasks are based on a strong, authentic curricular model, then accountability is embedded in the tasks that lead to completion of the unit goals.

Cooperative Learning provides a valuable alternative to the direct instruction that Kirk (2005) and Metzler (2005b) argue dominates the physical education curriculum. However, implementing CL as an instructional model requires adaptations in the ways teachers organize and manage their gymnasiums. It takes time to establish the classroom structure of CL. As with any substantive reform, this is a conceptual shift that requires a long term and concentrated effort on behalf of the teacher (Dyson, Griffin, & Hastie, 2004; Fullan, 1999). Anna engaged in extensive training, planning, and professional development to enable her to effectively teach her units of instruction. The data not only suggested that Anna was a good teacher but also demonstrated the ecology of CL in physical education, with a high number of refining tasks and extending tasks, consistent use of cognitive/social tasks, and significantly low management, transition, and wait times. While Cooperative Learning may not be appropriate for all teachers in all contexts, for those who are

prepared to adapt to a new instructional model, it can lead to an appropriate use of instruction, management, and social tasks in elementary physical education classes.

Acknowledgments

The authors would like to acknowledge the huge effort and contribution of the physical education teacher in this study.

References

- Allen, J.D. (1986). Classroom management: Students' perspective, goals, and strategies. *American Educational Research Journal*, 23, 437–459.
- Antil, L.R., Jenkins, J.R., Wayne, S.K., & Vadasy, P.F. (1998). Cooperative Learning: Prevalence, conceptualizations, and the relation between research and practice. *American Educational Research Journal*, 35, 419–454.
- Barrett, T. (2005). Effects of cooperative learning on the performance of sixth-grade physical education students. *Journal of Teaching in Physical Education*, 24, 88–102.
- Carlson, T.B., & Hastie, P.A. (1997). The student social system within sport education. *Journal of Teaching in Physical Education*, 16, 176–195.
- Cohen, E.G. (1994). Restructuring in the classroom: Conditions for productive small groups. *Review of Educational Research*, 64, 1–35.
- Doyle, W. (1977). Paradigms for research on teacher effectiveness. In L.S. Schulman (Ed.), *Review of Research in Education* (pp. 163–198). Itasca, IL: E.E. Peacock.
- Doyle, W. (1986). Classroom organization and management. In M.C. Whitrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 392–431). New York, NY: Macmillan.
- Dyson, B. (1994). *A case study of two alternative elementary physical education programs*. Unpublished doctoral dissertation, Ohio State University.
- Dyson, B. (2001). Cooperative learning in an elementary school physical education program. *Journal of Teaching in Physical Education*, 20, 264–281.
- Dyson, B. (2002). The implementation of cooperative learning in an elementary school physical education program. *Journal of Teaching in Physical Education*, 22, 69–85.
- Dyson, B. (2006). Students' perspectives in physical education. In D. Kirk, D. Macdonald, & M. O'Sullivan (Eds.), *The Handbook of Physical Education* (pp. 326–346). London, England: Sage.
- Dyson, B., & Grineski, S. (2001). Using cooperative learning structures to achieve quality physical education. *Journal of Physical Education, Recreation & Dance*, 72(2), 28–31.
- Dyson, B., Griffin, L., & Hastie, P. (2004). Sport education, tactical games, and cooperative learning: Theoretical and pedagogical considerations. *Quest*, 56, 226–240.
- Dyson, B., & Strachan, K. (2004). The ecology of cooperative learning in a high school physical education program. *Waikato Journal of Education*, 10, 117–140.
- Fullan, M. (1999). *Change Forces: The sequel*. London: Falmer Press.
- Gillies, R. M. (2006). Teachers' and students' verbal behaviours during cooperative and small-group learning. *The British Journal of Educational Psychology*, 76, 271–287.
- Graham, G. (Ed.). (1995). Physical education through students' eyes and in students' voices. *Journal of Teaching in Physical Education*, 14, 363–485 [Monograph].
- Hastie, P.A. (1995). An ecology of a secondary school outdoor adventure camp. *Journal of Teaching in Physical Education*, 15, 79–97.
- Hastie, P.A. (2000). An ecological analysis of a sport education season. *Journal of Teaching in Physical Education*, 19, 355–373.
- Hastie, P.A., & Siedentop, D. (2006). The classroom ecology paradigm. In D. Kirk, D. Macdonald, & M. O'Sullivan (Eds.), *The Handbook of Physical Education* (pp. 214–223). London, England: Sage.

- Johnson, D.W., & Johnson, R.T. (1989). *Cooperation and competition: Theory and research*. Edina, MN: Interaction Book.
- Jones, D.L. (1992). Analysis of task systems in elementary physical education classes. *Journal of Teaching in Physical Education, 11*, 411–425.
- Kirk, D. (2005). Future Prospects for Teaching Games for Understanding. In L. Griffin & J. Butler (Eds.), *Teaching Games for Understanding: Theory, research and practice* (pp. 213–227). Champaign, IL: Human Kinetics.
- Lafont, L., Proeres, M., & Vallet, C. (2007). Cooperative group learning in a team game: role of verbal exchanges among peers. *Social Psychology of Education, 10*, 93–113.
- Lincoln, Y.S., & Guba, E. (1985). *Naturalistic Inquiry*. Newbury Park, CA: Sage.
- Lund, J.L. (1992). Assessment and accountability in secondary physical education. *Quest, 44*, 352–360.
- Metzler, M.W. (2005a). *Instructional Models for Physical Education* (2nd ed.). Scottsdale, AZ: Holcomb Hathway.
- Metzler, M.W. (2005b). Implications of Models-Based Instruction for research on teaching: A focus on Teaching Games for Understanding. In L. Griffin & J. Butler (Eds.), *Teaching Games for Understanding: Theory, research and practice* (pp. 183–198). Champaign, IL: Human Kinetics.
- Metzler, M.W., & McCullick, B.A. (2008). Introducing innovation to those who matter most—The P–12 pupils' perceptions of the Model-Based Instruction. *Journal of Teaching in Physical Education, 27*, 512–528.
- Mosston, M. (1981). *Teaching physical education*. Columbus, OH: Merrill.
- National Association of Sport and Physical Education. (2004). *Moving into the future: National Standards for Physical Education* (2nd ed.). Reston, VA: Author.
- Patton, M.Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury, CA: Sage.
- Polvi, S., & Telama, R. (2000). The Use of Cooperative Learning as a Social Enhancer in Physical Education. *Scandinavian Journal of Educational Research, 44*, 105–115.
- Rink, J. (2003). Effective instruction in physical education. In S. Silverman & C.D. Ennis (Eds.), *Student learning in physical education: Applying research to enhance instruction* (2nd ed., pp. 165–186). Champaign, IL: Human Kinetics.
- Rovegno, I., & Kirk, D. (1995). Articulations and silences in social critical work on physical education: Towards a broader agenda. *Quest, 47*, 447–474.
- Schatzman, L., & Strauss, A. (1973). *Field research*. Englewood Cliffs, NJ: Prentice Hall.
- Siedentop, D. (1994). Task structure observation system. In M. O'Sullivan (Ed.), *Technical manual for high school physical education teachers: Their world of work* (pp. 18–28). Columbus: The Ohio State University School of Health, Physical Education, and Recreation.
- Siedentop, D., Doutis, P., Tsangaridou, N., Ward, P., & Rauschenbach, J. (1994). Don't sweat gym! An analysis of curriculum and instruction. *Journal of Teaching in Physical Education, 13*, 375–394.
- Slavin, R.E. (1996). Research on cooperative learning and achievement: What we know, what we need to know. *Contemporary Educational Psychology, 21*, 43–69.
- Tousignant, M., & Siedentop, D. (1983). A qualitative analysis of task structure in required secondary physical education classes. *Journal of Teaching in Physical Education, 3*, 47–57.
- van der Mars, H. (1989). Basic recording tactics. In P. Darst, D. Zakrajsek, & V. Mancini (Eds.), *Analyzing physical education and sport instruction* (pp. 19–51). Champaign, IL: Human Kinetics.